REMARKS

Applicant gratefully acknowledges that the Examiner has found patentable subject matter in independent claims 19 and 27, and would allow them if they were rewritten to overcome the Section 112 rejections. The foregoing amendments in the claims address the Section 112 issues, and these independent claims are therefore believed to be allowable.

Claims 20-25, dependent from claim 19, and 28-33, dependent from claim 27, are objected to as depending from a rejected claim, but otherwise allowable, with the correction of objections to claim 33. Claim 33 is also amended to correct the objections noted by the Examiner, and therefore claims 20-25 and 28-33 are also believed to be allowable.

Claims 26 and 34 are withdrawn. Method claims 1-18 are pending and rejected as anticipated by, or obvious over, the cited prior art.

The present invention is defined as an apparatus and method for determining the thickness of a reflective type liquid crystal device. The measurement is made with the liquid crystal layer in place in the device between a pair of substrates. The liquid crystal layer has alignment-treated upper and lower surfaces and a birefringent index Δn that is uniform in the thickness direction. Interrogatory polarized light enters the liquid crystal layer adjacent one substrate, is reflected adjacent the other substrate, and exits the liquid crystal layer to a light receiver. A "dispersing" method step spectrally resolves the reflected, exited light to determine a relationship between a wavelength λ and a reflected light intensity.

In the present invention defined as a method, there are three additional steps: a wavelength deriving step, a $\Delta n \bullet d$ deriving step, and a thickness (d) deriving step. The wavelength λ deriving step requires that the polarizing plane of the entering and exiting light remains the same. This occurs when the ordinary and extraordinary rays of the light have optical path lengths in the liquid crystal layer that are integer multiples of half or whole wavelengths. The $\Delta n \bullet d$ step derives this product, Δn times d, using the wavelength thus found, a

known twist angle of the liquid crystal layer, and a plurality of combinations of the wavelength and the <u>product</u>, $\Delta n \cdot d$. Finally, d is derived by assigning a known combination of the wavelength and Δn to the wavelength versus $\Delta n \cdot d$ relationship.

Method claims 1 and 10 define this general method. Claims 2-9 and 11-18 provide additional specificity to the defined method. As will be discussed below in more detail, this method is novel, and produces more accurate results than any method known in or suggested by the prior art.

Applicant respectfully traverses the rejection of claims 1-3, 7, 10-12, and 16 under 35 U.S.C. 102 as anticipated by U.S. Patent No. 6,081,377 to Kwok et al.; the rejection of claims 4-6 and 13-15 under 35 U.S.C. 103 as obvious over Kwok et al; and the rejection of claims 8 and 17 under 35 U.S.C. 103 as obvious over Kwok et al. in view of U.S. Patent No. 6,233,030 to Oh-Ide et al.; and the rejection of claims 9 and 18 under 35 U.S.C. 103 as obvious over Kwok et al. in view of U.S. Patent No. 6,266,113 to Yamazaki et al.

Kwok et al. discloses a method and apparatus for measuring cell gap in transmissive-type and reflective-type liquid crystal cells that are filled with a liquid crystal material when measured. Kwok uses the apparatus of Figs. 2, 4, or 5 for reflective-type cells. A first polarizer 8, 20 is situated between a light source and the cell and a second polarizer (an "analyzer") 11, 22 is situated between the cell and a spectral analyzer. The polarizers are "crossed", that is, orthogonal. The spectral analysis looks for null transmissions produced as one rotates the cell.

The method disclosed in Kwok et al., however, differs from the present claimed invention in the manner of deriving $d\Delta n$. More specifically, the present invention takes into account the wavelength dispersity of the birefringent under Δn of the liquid crystal layer, whereas the Kwok et al. method does not.

Kwok et al. obtain a null wavelength λ_0 that does not "shift" (compare Kwok et al. Figs. 6 and 7) as the cell is rotated. Kwok et al. say that they derive the cell gap d by inserting this value of λ_0 into their equation (2). This process,

however, does not take into account the wavelength dispersity of the birefringent represented by Δn.

In practice, the wavelength dispersity of the birefringent index Δn of liquid crystal has normal dispersity – Δn becomes smaller as the wavelength becomes greater. Generally the wavelength of 589 nm is employed for the measurement of Δn. In Kwok, the value of the wavelength used in the calculation of equation (2) is not 589 nm, but λ_o obtained as the null wavelength $d\Delta n$ is obtained based on wavelength λ_o. The known value of Δn is inserted into this $d\Delta n$ to obtain d. But this "known Δn" does not mean the birefringent index at wavelength λ_o. It is merely a birefringent index prepared as general data. Where the wavelength employed in the measurement of obtaining Δn in advance differs greatly from the null wavelength λ_o, the value of cell gap d obtained as the final result will include an error, leading to degradation in the measurement accuracy. Essentially, a precise value of d cannot be obtained unless Δn used in calculating d has been measured at the null wavelength λ_o. The Kwok reference neither recognizes this source of inaccuracy, nor provides a solution.

In contrast, in the invention of the present application, d is obtained by applying the known combination of wavelength λ and Δn with respect to the relationship between the wavelength and $\Delta n \bullet d$, obtained by the "$\Delta n \bullet d$ deriving step". This known combination is applied because the wavelength dispersity of the birefringent index Δn of liquid crystal is taken into account.

The invention of the present application has the cell gap d obtained with the wavelength dispersity of the birefringent index Δn of liquid crystal taken into account, as compared to the invention of Kwok that does not take into account this feature. The technical concept thus differs greatly between the subject application and Kwok based on this feature. This feature of the invention of the present application is found in claim 1 in the $\Delta n \bullet d$ deriving step and the thickness deriving step in the claims. As an important practical advantage, the invention of the present application is superior to Kwok et al. based on the fact that a more accurate value of d can be obtained than by Kwok et al. since the wavelength dispersion of Δn is also taken into account.

Kwok et al. therefore do not teach the present method invention as claimed. Nor do they suggest applicant's invention, either alone or in combination with the other art of record.

In view of the foregoing amendments and remarks, applicant urges that all the claim now pending define patentable subject matter and that this application is otherwise in conditions for allowance.

Respectfully submitted,

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